

Note : There are **four** questions in this section. Attempt **any one** question. Each question carries **15** marks.

[1×15=15]

6. What is a Sparse Matrix? Describe its types (lower triangular, upper triangular, and tridiagonal matrices) and explain their vector representation with an example in C/C++.
7. Describe algorithm for converting *infix* to *postfix* notation and for evaluating postfix expressions.
8. Compare sequential lists and linked lists. Discuss advantages and disadvantages of each with respect to memory utilization, access time, and flexibility.
9. Define a graph and discuss various graph representations. Explain *adjacency matrix* and *adjacency list* representations with examples in C/C++.

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Roll No. :

BCA-3002

BCA (Semester-III) (NEP) Examination, 2025-26

DATA STRUCTURE USING C AND C++

[Paper : Second]

Time : 2 Hours]

[Maximum Marks : 75

Note : 1. Attempt questions from **all** sections as directed.

2. The candidates are required to answer only in serial order. If there are many parts of a question, answer them in continuation.

3. "B" copy will not be provided.

Section-A

Short Answer Type Questions

Note : There are **nine** questions in this section. Attempt **all** questions. Each question carries **5** marks. [9×5=45]

1. (a) Define Data Structure. What are the main characteristics of data structures?



- (b) How a two-dimensional array is represented in memory? Explain.
- (c) Write the algorithm for *pushing* and *popping* an element in a stack.
- (d) Differentiate between infix, postfix, and prefix expressions with examples.
- (e) What are the advantages of using linked lists over arrays?
- (f) Write a short note on doubly linked lists and their operations.
- (g) Define a Binary Tree and Binary Search Tree.
- (h) Write the recursive algorithm for inorder traversal of a binary tree.
- (i) What is the difference between BFS (Breadth First Search) and DFS (Depth First Search)?

Section-B

Long Answer Type Questions

Note : There are **four** questions in this section. Attempt **any one** question. Each question carries **15** marks.

[1×15=15]

- 2. Explain the memory representation of single and multidimensional arrays. Derive the formula to calculate the address of any element in a two-dimensional array.
- 3. What is a queue? Explain the operations of *simple*, *circular*, *double-ended (deque)*, and *priority queues* with diagrams and sample code in C/ C++.
- 4. Write and explain algorithms for *insertion* and *deletion* operations at the *beginning*, *middle*, and *end* of a singly linked list in C/ C++. Include diagrams to illustrate each case.
- 5. What is a Binary Search Tree (BST)? Explain how *insertion*, *deletion*, and *searching* operations are performed in BST with suitable examples.

Section-C

Long Answer Type Questions